

PORTLAND HARBOR RI/FS

APPENDIX K

SURFACE WATER EVALUATION

FEASIBILITY STUDY

June 2016

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K1. SURFACE WATER QUALITY CRITERIA

Surface water COCs include:

- Aldrin
- Arsenic
- BEHP
- Chlordanes
- Chromium
- Copper
- DDD, DDE, DDT, and DDx
- Ethylbenzene
- Hexachlorobenzene
- MCPP
- Pentachlorophenol
- PCBs
- cPAHs
- PAHs [benzo(a)anthracene, benzo(a)pyrene, naphthalene]
- TBT
- 2,4,7,8-TCDD eq

Surface water quality criteria for these COCs are based on protection of human health or the aquatic environment. The water quality criteria for these COCs are presented in **Table K1-1**.

Since the presence of some of these COCs are due to upland or upriver sources, they were not included in this evaluation. These include: chromium, ethylbenzene, hexachlorobenzene, MCPP, and pentachlorophenol. Aldrin was not able to be evaluated due to insufficient data. Other COCs were not evaluated due to insufficient detections. These include: BEHP, PAHs, and TBT. Lastly, some COCs do not exceed water quality criteria on a Site-wide scale. These include: arsenic, chlordanes, copper, DDx, PCBs (aquatic life only), and zinc. The remaining COCs are all related to protection of human health; thus, protection of aquatic life cannot be evaluated with the existing data set. Therefore, this analysis was performed for the following COCs: DDE, DDD, DDT, PCBs, cPAHs, and 2,3,7,8-TCDD eq.

K2. SURFACE WATER DATA

Surface water transect data was used to determine reductions in Site-wide surface water expected from reductions in sediment concentrations from construction of each of the alternatives. Based on the methodology used to collect and analyze surface water samples on a smaller spatial scale, it is not possible to conduct an analysis of future reductions in surface water from construction of each of the alternatives.

The transect data were collected during three flow events: low flow, storm water-influenced flow, and high flow. Surface water samples used in this evaluation were collected during the Round 3A RI sampling event at six transect locations: RM 16, RM 11, RM 6.3, RM 4, RM 2 and at the entrance to Multnomah Channel because only this data set analyzed all COCs at all transects. Therefore, this evaluation is limited by a single sampling event conducted over three seasons.

Two different sampling approaches were utilized to collect the surface water transect samples. At RM 2 and 11, transects were subdivided into three lateral segments across the river – east shoreline, navigation channel and west shoreline – and vertically integrated surface water samples collected. At RM 16, RM 6.3, RM 3.9 and the entrance to Multnomah Channel, cross-sectional near-bottom and near-surface surface water samples were collected. Surface water data utilized in this analysis were collected using an Infiltrax 300 system connected to XAD-2 resin columns to collect hydrophobic organic compounds for analysis by ultra-low analytical methods. The total surface water concentrations was used in this analysis.

The three specific flow conditions used for this analysis include:

September 2006 Low-flow Event: Low flow conditions were monitored in September 2006. Willamette River flow as measured at the Morrison Bridge USGS gauge was 8730 cfs. Surface water samples were collected September 4–13.

November 2006 Storm water Event: A water runoff monitoring event was conducted November 2006 evaluate the contribution of storm water to surface water during relatively low flow Willamette River conditions (23,000 cfs as measured at the Morrison Bridge). Surface water samples were collected between Surface water samples were collected November 2–5 during a storm water runoff event.

Winter 2007 High-flow Event: High flow conditions were monitoring in January and February 2007. Willamette River flow conditions were 59,800 cfs in January and 60,900 cfs in February as measured at the Morrison Bridge. The high-flow surface water sampling event was split into two phases because of a sudden drop in precipitation after the first 3 days of sampling. The first phase took place January 15–18, 2007 while the second phase took place February 21 through March 10, 2007.

Surface water sampling for each event is described further in Section 2.1.4.1.1 of the RI Report and the field sampling reports. The data used in the analysis is provided in **Tables K1-1 through K1-3**.

K3. REDUCTIONS IN SURFACE WATER CONCENTRATIONS

The evaluation of estimate reductions in surface water concentrations following remediation (t=0) was conducted only on a Site-wide scale. Reductions on smaller spatial scales or associated with watershed efforts or source control were not included for the purpose of this analysis, although current watershed (upstream) and upriver (downtown) contributions are conducted as part of this analysis.

K3.1 APPROACH

The approach was to determine the reductions in Site-wide sediment concentrations and apply that reduction to the surface water concentrations for each COC.

K3.2 REDUCTION IN SITE-WIDE SEDIMENT CONCENTRATIONS

The approach used to develop weighted Site-wide sediment SWACs in Appendix J was used to determine the current Site-wide sediment SWAC (PreSWAC) for each COC. This approach was also used to determine the post remedial sediment SWAC (Post SWAC) for each COC by alternative. These values are provided in **Table K3-1**. The percent SWAC reduction was calculated using these values in the following equation:

$$\text{Percent SWAC Reduction} = \left[1 - \left(\frac{\text{Post SWAC}}{\text{Pre SWAC}} \right) \right] \quad \text{Equation K1-1}$$

The resulting percent SWAC reduction for each COC by alternative is presented in **Table K3-2**.

K3.3 INITIAL SURFACE WATER CONCENTRATIONS

The current upstream surface water concentration for each COC was calculated from weighted transect surface water data at RM 16. A weight of 3 was given to the low flow, 1 was given to stormwater-influenced flow, and 8 was given to high flow. This weighting was developed from the average annual hydrograph for the lower Willamette River (**Figure K3-1**). This average annual flow represents the surface water concentration from the broader watershed (**Tables K3-3a-f** and **K3-4a-f**).

In order to calculate the contribution of contamination in the downtown reach, the current surface water concentrations at RM 11W and RM 11M for all three flow conditions were used since transect data is not available immediately above the upper Site boundary. RM 11E was not used since there is a known source in that area and sediment concentrations are elevated; thus, it is not representative of concentrations entering the Site. The current surface water concentration for each COC entering the Site was also calculated as a weighted average (**Tables K3-3a-f**). The concentration from upstream was then subtracted from the concentration entering the site to obtain the average annual

concentration from the downtown reach. These values are all presented in **Tables K3-4a-f**.

The current Site-wide weighted surface water concentration (**Tables K3-3a-f**) was calculated using the weighted transect surface water concentration for each COC using the data from transects RM 11, 6.3, 3.9, 2 and Multnomah Channel in each river flow event (**Tables K3-5a-f**). The same weighting was given to each flow event as was used for upstream and entering the Site. The weighted transect data was then averaged to obtain the total annual average Site-wide surface water concentration (**Tables K3-4a-f**). The concentration entering the Site was then subtracted from the average Site concentration to obtain the average annual concentration from the downtown reach. These values are all presented in **Tables K3-4a-f**.

The water quality criterion for each COC is also presented in these tables for comparative purposes.

K3.4 POST-CONSTRUCTION SURFACE WATER CONCENTRATIONS

This analysis assumed that the upstream and downtown surface water concentrations would remain unchanged following implementation of the sediment remediation. For the reduction in surface water concentration associated with construction of each alternative it is assumed that the remedy only addresses Site surface water contributions (Site minus upstream and downtown).

The Site surface water contribution is assumed to be reduced by a percentage equal to the Site-wide surface sediment SWAC reduction for each alternative (**Table K3-2**). These percentage reduction values were applied to current Site surface water contributions to estimate the reduction in surface water concentrations within the Site for each alternative. Thus, the estimated post-construction surface water concentration for each alternative was obtained using the following equation:

$$C_{post-const} = C_{Siteinitial} (1 - \%SWAC\ reduction) \quad \text{Equation K3-1}$$

The net reduction was then calculated using the following equation:

$$Net\ Reduction\ (\%) = \left[1 - \frac{C_{post-const}}{C_{Siteinitial}} \right] \quad \text{Equation K3-2}$$

where:

$C_{post-cont}$ = post-construction contaminant concentration (µg/L)
 $C_{initial}$ = initial contaminant concentration (µg/L)

K4. SURFACE WATER LOADING CALCULATIONS

The evaluation of estimate reductions in surface water loading to the Columbia River following remediation (t=0) was conducted only on a Site-wide scale. Reductions on smaller spatial scales or associated with watershed efforts or source control were not included for the purpose of this analysis, although current watershed (upstream) and upriver (downtown) contributions are conducted as part of this analysis.

K4.1 APPROACH

The approach was to determine the reductions in Site-wide sediment loading and apply that reduction to the surface water loading for each COC.

K4.2 INITIAL SURFACE WATER LOADS

A contaminant loading evaluation was performed to estimate contaminant loading site from upriver (upstream of RM 16); the contaminant load entering the site (RM 11.8); how contaminant loading changes within the site (RM 6.3 and 3.9); and the contaminant loading exiting the site (RM 2 and Multnomah Channel) under a range of Willamette River flow conditions. Contaminant loading estimates are considered fundamental to the conceptual site model and may be used in conjunction with other site data to evaluate the effectiveness of monitored natural recovery to understand the degree to which the site remedy will reduce downstream loading.

Loading estimates were developed at each of the six transects using the data set discussed in Section 2. For monitoring stations with 3 vertically integrated surface water samples (east, mid-channel, and west), it was assumed that the flow was equally distributed between the 3 stations. In calculating the contaminant load entering the Site, the sample collected at RM 11E was excluded from the data set due to the presence of known contaminant sources at this location and replaced with the RM 11M value. For monitoring stations with near bottom and near surface samples (RM 16, RM 6.3, RM 3.9, and Multnomah Channel), it was assumed that 50 percent of the flow was in the upper portion of the water column as measured using the near-surface surface water sample and that 50 percent of the flow was in the lower portion of the water column as measured using the near-bottom surface water sample.

The initial seasonal flow loads (g/day) were calculated using the following equation:

$$Load_i = C_{flow} \times Q_{flow} \times CF \quad \text{Equation K4-1}$$

where:

C_{flow} = contaminant concentration under specific flow condition (µg/L)
 Q_{flow} = flow rate under specific flow condition (cfs)
 CF = units conversion factor (2.45)

The annual average loads (kg/year) were calculated using the following equation:

$$Annual\ Load_i = \frac{average(Q_{low} \times 90, Q_{sw-infl} \times 30, Q_{high} \times 240)}{1000} \quad \text{Equation K4-2}$$

where:

Q = surface water flow for each flow event (cfs)

The results of the loading estimates are presented in **Tables K4-1a-f**. The results show that upstream sources of COCs are generally low with slight increases in loading in the downtown reach between RM 16 and RM 11. The results also show that the largest increase in contaminant loading takes place within the downtown reach; however, the Site is a source of contamination to the Columbia River for all COCs under all flow conditions.

K4.3 POST-CONSTRUCTION SURFACE WATER LOADS

This analysis assumed that the upstream and downtown surface water loads would remain unchanged following implementation of the sediment remediation. For the reduction in surface water load associated with construction of each alternative it is assumed that the remedy only addresses Site surface water contributions (Site minus upstream and downtown).

The Site surface water contribution is assumed to be reduced by a percentage equal to the Site-wide surface sediment SWAC reduction for each alternative (**Table K3-2**). These percentage reduction values were applied to current Site surface water contributions to estimate the reduction in surface water loads within the Site for each alternative. Thus, the estimated post-construction surface water concentration for each alternative was obtained using the following equation:

$$Load_{post-const} = C_{site\ initial} (1 - \%SWAC\ reduction) \times Q_{flow} \times CF \quad \text{Equation K4-3}$$

where:

$C_{site\ initial}$ = initial contaminant concentration (µg/L)

Q_{flow} = flow rate under specific flow condition (cfs)

CF = units conversion factor (2.45)

The results of this analysis indicate that all loads for all COCs under all flow conditions do contribute appreciably to the surface water loads to the Columbia River once Alternative B is implemented (**Table K4-2a-f**), thus no further analysis was conducted for the remaining alternatives.

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Tables

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Table K2-1a**Surface Water Transect Data for September 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	Arsenic (µg/L)		Copper (µg/L)		TBT (µg/L)		Zinc (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.51		1.55		0.0006	U	4.2	
W005	NS	3.9	0.46		1.1		0.0006	UJ	3.4	
W011	NB	6.3	0.455		1.3		0.0006	U	3.7	
W011	NS	6.3	0.457		0.88		0.0006	U	2.6	
W023	E	11	0.47		1.12		0.0006	U	4.5	
W023	M	11	0.46		0.84		0.0006	U	3.2	
W023	W	11	0.48		1.01		0.0006	U	6.1	
W024	NB	16	0.427		0.705		0.0006	U	2.4	
W024	NS	16	0.418		0.68		0.0006	U	2.5	
W025	E	2	0.64		1.22		0.0006	U	3.35	
W025	M	2	0.61		1.09		0.0006	U	2.6	
W025	W	2	0.56		1.08		0.0006	U	3	
W027	NB	MC	0.5		1.3		0.0006	U	3.5	
W027	NS	MC	0.49		1.24		0.0006	U	3.4	

Table K2-1b**Surface Water Transect Data for September 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	BEHP (µg/L)		Chlordane (µg/L)		DDD (µg/L)		DDE (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.7						0.00013	J
W005	NS	3.9	0.47	U	0.00005	J	0.00027	J	0.00007	J
W011	NB	6.3	0.15	U	0.00004	J	0.00025		0.00010	J
W011	NS	6.3	0.24	U	0.00005	J	0.00018	J	0.00006	J
W023	E	11	0.36	U	0.00004	J	0.00005	J	0.00004	J
W023	M	11	0.21	U	0.00003	J	0.00004	J	0.00003	J
W023	W	11	0.21	U	0.00004	J	0.00006	J	0.00003	J
W024	NB	16	0.14	U	0.00002	J	0.00003	J	0.00003	J
W024	NS	16	0.4	U	0.00002	J	0.00003	J	0.00002	J
W025	E	2	1.5		0.00003	J	0.00022	J	0.00005	J
W025	M	2	0.26	U	0.00003	J	0.00020	J	0.00005	J
W025	W	2	1.2		0.00004	J	0.00026	J	0.00005	J
W027	NB	MC	0.12	U	0.00004	J	0.000319		0.00009	J
W027	NS	MC	1.3		0.00004	J	0.000356		0.00009	J

Table K2-1c**Surface Water Transect Data for September 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	DDT (µg/L)		DDx (µg/L)		PCBs (µg/L)		cPAHs (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.00008	J	0.00055	J	0.000951	J	0.0042	J
W005	NS	3.9	0.00003	J	0.00038	J	0.000668	J	0.0014	J
W011	NB	6.3	0.00008	J	0.00044	J	0.000948	J	0.0035	J
W011	NS	6.3	0.00005	J	0.00029	J	0.000674	J	0.0014	J
W023	E	11	0.00001	J	0.00010	J	0.000951	J	0.0008	J
W023	M	11	0.00001	J	0.00009	J	0.000278	J	0.0004	J
W023	W	11	0.00001	J	0.00010	J	0.000275	J	0.0003	J
W024	NB	16	0.00001	J	0.00007	J	0.000174	J	0.0002	J
W024	NS	16	0.00001	J	0.00006	J	0.000159	J	0.0001	J
W025	E	2	0.00001	J	0.00028	J	0.000433	J	0.0002	J
W025	M	2	0.00001	J	0.00026	J	0.000377	J	0.0003	J
W025	W	2	0.00001	J	0.00032	J	0.000430	J	0.0002	J
W027	NB	MC	0.00005	J	0.00045	J	0.000657	J	0.002463	J
W027	NS	MC	0.00005	J	0.00050	J	0.000665	J	0.002024	J

Table K2-1d**Surface Water Transect Data for September 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	Benzo(a)anthracene (µg/L)		Benzo(a)pyrene (µg/L)		Naphthalene (µg/L)		2,3,7,8-TCDD EQ (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.0078	U	0.0086	U	0.013	U	2.06E-07	J
W005	NS	3.9	0.0078	U	0.0086	U	0.013	U	7.39E-08	J
W011	NB	6.3	0.0078	U	0.0086	U	0.013	U	1.62E-07	J
W011	NS	6.3	0.0078	U	0.0086	U	0.013	U	6.83E-08	J
W023	E	11	0.0078	U	0.0086	U	0.013	U	6.89E-08	J
W023	M	11	0.0078	U	0.0086	U	0.013	U	4.86E-08	J
W023	W	11	0.0078	U	0.0086	U	0.013	U	4.87E-08	J
W024	NB	16	0.0078	U	0.0086	U	0.013	U	3.16E-08	J
W024	NS	16	0.0078	U	0.0086	U	0.013	U	2.71E-08	J
W025	E	2	0.0078	U	0.0086	U	0.013	U	3.02E-08	J
W025	M	2	0.0078	U	0.0086	U	0.013	U	3.17E-08	J
W025	W	2	0.0078	U	0.0086	U	0.013	U	2.96E-08	J
W027	NB	MC	0.0078	U	0.0086	U	0.013	U	9.7E-08	J
W027	NS	MC	0.0078	U	0.0086	U	0.013	U	9.58E-08	J

Table K2-2a**Surface Water Transect Data for November 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	Arsenic (µg/L)		Copper (µg/L)		TBT (µg/L)		Zinc (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9			1.02		0.0006	U	3.8	U
W005	NS	3.9	0.446	J	0.96		0.0006	U	3.6	U
W011	NB	6.3	0.447	UJ	0.85		0.001	J	4	U
W011	NS	6.3	0.422	UJ	0.72		0.0006	UJ	4.1	U
W023	E	11	0.419	UJ	0.94		0.0006	UJ	4	U
W023	M	11	0.41	UJ	0.65		0.0006	UJ	2.7	U
W023	W	11	0.394	UJ	0.75		0.0006	UJ	2.6	U
W024	NB	16	0.406	UJ	0.83		0.011	J	4.5	UJ
W024	NS	16	0.42	UJ	1.1		0.0006	U	5.4	U
W025	E	2	0.436	UJ	0.84		0.0006	UJ	4.5	U
W025	M	2	0.442	UJ	0.86		0.0006	UJ	3.6	U
W025	W	2	0.647	UJ	0.87		0.0006	UJ	3.6	U
W027	NB	MC	0.457	J	0.89		0.0006	U	3.4	U
W027	NS	MC	0.439	J	0.86		0.0006	U	3.3	U

Table K2-2b**Surface Water Transect Data for November 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	BEHP (µg/L)		Chlordane (µg/L)		DDD (µg/L)		DDE (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.64	UJ	0.00003	J	0.00008	J	0.00004	J
W005	NS	3.9	6.8	J	0.00003	J	0.00007	J	0.00004	J
W011	NB	6.3	1.2	UJ	0.00003	J	0.00011	J	0.00006	J
W011	NS	6.3	1.9	UJ	0.00003	J	0.00006	J	0.00004	J
W023	E	11	1.2	U	0.00003	J	0.00002	J	0.00004	J
W023	M	11	0.78	U	0.00002	J	0.00002	J	0.00001	J
W023	W	11	1.8	U	0.00003	J	0.00002	J	0.00004	J
W024	NB	16	0.26	UJ	0.00004	J	0.00004	J	0.00004	J
W024	NS	16	1.9	UJ	0.00004	J	0.00004	J	0.00003	J
W025	E	2	1.1	UJ	0.00003	J	0.00006	J	0.00004	J
W025	M	2	0.59	U	0.00003	J	0.00011	J	0.00004	J
W025	W	2	0.14	U	0.00002	J	0.00009	J	0.00004	J
W027	NB	MC	0.29	UJ	0.00004	J	0.00007	J	0.00004	J
W027	NS	MC	0.23	UJ	0.00004	J	0.00008	J	0.00004	J

Table K2-2c**Surface Water Transect Data for November 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	DDT (µg/L)		DDx (µg/L)		PCBs (µg/L)		cPAHs (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.00004	J	0.00016	J	0.000444	J	0.0028	J
W005	NS	3.9	0.00003	J	0.00014	J	0.000461	J	0.0023	J
W011	NB	6.3	0.00003	J	0.00020	J	0.000285	J	0.0027	J
W011	NS	6.3	0.00003	J	0.00013	J	0.000242	J	0.0016	J
W023	E	11	0.00004	J	0.00010	J	0.000558	J	0.0023	J
W023	M	11	0.00001	J	0.00004	J	0.000128	J	0.0007	J
W023	W	11	0.00004	J	0.00010	J	0.000229	J	0.0009	J
W024	NB	16	0.00001	J	0.00009	J	0.000205	J	0.0000	J
W024	NS	16	0.00001	J	0.00006	J	0.000149	J	0.0001	J
W025	E	2	0.00002	J	0.00012	J	0.001300	J	0.0019	J
W025	M	2	0.00003	J	0.00018	J	0.000394	J	0.0026	J
W025	W	2	0.00001	J	0.00015	J	0.000240	J	0.0018	J
W027	NB	MC	0.00003	J	0.00014	J	0.000311	J	0.00321	J
W027	NS	MC	0.00003	J	0.00015	J	0.000332	J	0.00328	J

Table K2-2d**Surface Water Transect Data for November 2006 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	Benzo(a)anthracene (µg/L)		Benzo(a)pyrene (µg/L)		Naphthalene (µg/L)		2,3,7,8-TCDD EQ (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.0078	U	0.0086	U	0.013	U	1.32E-07	J
W005	NS	3.9	0.0039	U	0.0043	U	0.0065	U	8.94E-08	J
W011	NB	6.3	0.0078	U	0.0086	U	0.022	U	1.43E-07	J
W011	NS	6.3	0.0078	U	0.0086	U	0.018	U	6.66E-08	J
W023	E	11	0.0078	U	0.0086	U	0.027	U	2.88E-07	J
W023	M	11	0.0078	U	0.0086	U	0.027	U	5.36E-08	J
W023	W	11	0.0078	U	0.0086	U	0.036	U	1.01E-07	J
W024	NB	16	0.0078	U	0.0086	U	0.019	U	4.06E-08	J
W024	NS	16	0.0078	U	0.0086	U	0.039	U	8.22E-08	J
W025	E	2	0.0078	U	0.0086	U	0.029	U	8.81E-08	J
W025	M	2	0.0078	U	0.0086	U	0.024	U	6.76E-08	J
W025	W	2	0.0078	U	0.0086	U	0.042	U	6.27E-08	J
W027	NB	MC	0.0079	J	0.0043	U	0.0065	U	1.1E-07	J
W027	NS	MC	0.0078	U	0.0086	U	0.013	U	1.39E-07	J

Table K2-3a**Surface Water Transect Data for January-March 2007 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	Arsenic (µg/L)		Copper (µg/L)		TBT (µg/L)		Zinc (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.309		1.86		0.0006	U	5.6	
W005	NS	3.9	0.324		1.76		0.0006	U	4.2	
W011	NB	6.3	0.356	J	2.12		0.0006	U	3.9	
W011	NS	6.3	0.317	J	1.94		0.0006	U	4.2	
W023	E	11	0.329		1.79		0.0006	U	4	
W023	M	11	0.307		1.52		0.0006	U	3.475	
W023	W	11	0.334		2.05		0.0006	U	4	
W024	NB	16	0.254		1.16		0.0006	U	2.45	
W024	NS	16	0.459		1.19		0.0006	U	2.3	
W025	E	2	0.299		1.33		0.0006	U	3.5	
W025	M	2	0.26		1.16		0.0006	U	2.05	
W025	W	2	0.267		1.1		0.0006	U	1.85	
W027	NB	MC	0.402	J	2.93		0.0006	U	6	
W027	NS	MC	0.353	J	2.56		0.0006	U	4.9	

Table K2-3b**Surface Water Transect Data for January-March 2007 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	BEHP (µg/L)		Chlordane (µg/L)		DDD (µg/L)		DDE (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.27	U	0.00009	J	0.00011	J	0.00018	J
W005	NS	3.9	1.3	J	0.00009	J	0.00009	J	0.00017	J
W011	NB	6.3	2.2	J	0.00007	J	0.00009	J	0.00017	J
W011	NS	6.3	0.41	U	0.00007	J	0.00009	J	0.00017	J
W023	E	11	0.82	U	0.00009	J	0.00012	J	0.00020	J
W023	M	11	1.1	J	0.00005	J	0.00007	J	0.00011	J
W023	W	11	0.42	U	0.00007	J	0.00009	J	0.00016	J
W024	NB	16	0.76	UJ	0.00005	J	0.00007	J	0.00012	J
W024	NS	16	2.1	J	0.00004	J	0.00007	J	0.00010	J
W025	E	2	1.6	J	0.00004	J	0.00005	J	0.00009	J
W025	M	2	0.525	UJ	0.00004	J	0.00005	J	0.00008	J
W025	W	2	0.16	U	0.00004	J	0.00006	J	0.00009	J
W027	NB	MC	1.4	U	0.00006	J	0.00010	J	0.00016	J
W027	NS	MC	0.66	U	0.00006	J	0.00008	J	0.00014	J

Table K2-3c**Surface Water Transect Data for January-March 2007 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	DDT (µg/L)		DDx (µg/L)		PCBs (µg/L)		cPAHs (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.00029	J	0.00058	J	0.000392	J	0.00089	J
W005	NS	3.9	0.00027	J	0.00054	J	0.000140	J	0.00049	J
W011	NB	6.3	0.00022	J	0.00048	J	0.000138	J	0.00060	J
W011	NS	6.3	0.00025	J	0.00050	J	0.000133	J	0.00048	J
W023	E	11	0.00029	J	0.00062	J	0.000170	J	0.00062	J
W023	M	11	0.00019	J	0.00038	J	0.000077	J	0.00034	J
W023	W	11	0.00022	J	0.00047	J	0.000137	J	0.00067	J
W024	NB	16	0.00003	J	0.00042	J	0.000071	J	0.00002	J
W024	NS	16	0.00001	J	0.00035	J	0.000078	J	0.00009	J
W025	E	2	0.00011	J	0.00025	J	0.000166	J	0.00058	J
W025	M	2	0.00010	J	0.00022	J	0.000118	J	0.00033	J
W025	W	2	0.00011	J	0.00026	J	0.000111	J	0.00042	J
W027	NB	MC	0.00011	J	0.00038	J	0.000276	J	0.000744	J
W027	NS	MC	0.00014	J	0.00036	J	0.000250	J	0.000711	J

Table K2-3d**Surface Water Transect Data for January-March 2007 Sampling Event**

Portland Harbor Superfund Site

Portland, OR

Station	ID	RM	Benzo(a)anthracene (µg/L)		Benzo(a)pyrene (µg/L)		Naphthalene (µg/L)		2,3,7,8-TCDD EQ (µg/L)	
			Value	Qualifiers	Value	Qualifiers	Value	Qualifiers	Value	Qualifiers
W005	NB	3.9	0.0078	U	0.0086	U	0.013	U	7.35E-08	J
W005	NS	3.9	0.0078	U	0.0086	U	0.013	U	5.34E-08	J
W011	NB	6.3	0.0078	U	0.0086	U	0.013	U	5.12E-08	J
W011	NS	6.3	0.0078	U	0.0086	U	0.013	U	4.26E-08	J
W023	E	11	0.0078	U	0.0086	U	0.013	U	7.09E-08	J
W023	M	11	0.0078	U	0.0086	U	0.013	U	3.81E-08	J
W023	W	11	0.0078	U	0.0086	U	0.013	U	5.77E-08	J
W024	NB	16	0.0078	U	0.0086	U	0.018		1.74E-08	J
W024	NS	16	0.0078	U	0.0086	U	0.014	J	2.41E-08	J
W025	E	2	0.0078	U	0.0086	U	0.013	U	4.52E-08	J
W025	M	2	0.0078	U	0.0086	U	0.013	U	3.47E-08	J
W025	W	2	0.0078	U	0.0086	U	0.013	U	2.98E-08	J
W027	NB	MC	0.0078	U	0.0086	U	0.013	U	7.09E-08	J
W027	NS	MC	0.0078	U	0.0086	U	0.013	U	7.04E-08	J

Table K3-1**Surface Sediment Site-wide weighted SWACs**

Portland Harbor Superfund Site

Portland,

OR

Focused COC	PreSWAC	Post SWAC						Units
		Alternative B	Alternative D	Alternative E	Alternative F	Alternative G	Alternative I	
PCB	208	74	56	40	23	17	40	µg/L
cPAH	4908	811	359	359	283	129	645	µg/L
DDD	27	9	7	4	3	2	3	µg/L
DDE	13	4	3	2	2	1	2	µg/L
DDT	100	7	6	5	3	2	4	µg/L
TCDD TEQ	0.057	0.004	0.003	0.003	0.002	0.002	0.003	µg/L
Arsenic	4.5	4.2	3.9	3.6	3.1	2.6	3.7	µg/L
BEHP	618	530	446	325	165	112	339	µg/L
Chlordanes	6.5	3.7	2.8	1.8	1.2	0.9	1.8	µg/L

Table K3-2**Percent Reduction in Surface Sediment Site-wide weighted SWACs**

Portland Harbor Superfund Site

Portland,

OR

Focused COC	PreSWAC	Percent Reduction (Site Wide)					
		Alternative B	Alternative D	Alternative E	Alternative F	Alternative G	Alternative I
PCB	208	65%	73%	81%	89%	92%	81%
cPAH	4908	83%	93%	93%	94%	97%	87%
DDD	27	68%	76%	86%	91%	94%	87%
DDE	13	71%	77%	81%	86%	89%	81%
DDT	100	93%	94%	95%	97%	98%	96%
TCDD TEQ	0.057	92%	94%	95%	97%	96%	94%
Arsenic	4.5	7%	14%	21%	33%	44%	19%
BEHP	618	14%	28%	47%	73%	82%	45%
Chlordanes	6.5	43%	57%	73%	82%	86%	72%

Table K3-3a**Weighted Surface Water Concentrations for cPAHs**

Portland Harbor Superfund Site

Portland, OR

	cPAH concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
Average Upstream	0.0002	0.0000	0.0001	0.0001
Average Entering Site	0.0003	0.0008	0.0005	0.0005
Average Site	0.0011	0.0022	0.0006	0.0008
Site Minus Upstream	0.0009	0.0021	0.0005	0.0008
Criterion	0.0001	0.0001	0.0001	0.0001

Table K3-3b**Weighted Surface Water Concentrations for DDD**

Portland Harbor Superfund Site

Portland, OR

	DDD concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
Average Upstream	0.00003	0.00004	0.00007	0.00006
Average Entering Site	0.00005	0.00002	0.00008	0.00007
Average Site	0.00018	0.00007	0.00008	0.00011
Site Minus Upstream	0.00015	0.00003	0.00001	0.00005
Criterion	0.00003	0.00003	0.00003	0.00003

Table K3-3c**Weighted Surface Water Concentrations for DDE**

Portland Harbor Superfund Site

Portland, OR

	DDE concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
Average Upstream	0.00002	0.00004	0.00011	0.00008
Average Entering Site	0.00003	0.00003	0.00013	0.00010
Average Site	0.00007	0.00004	0.00014	0.00012
Site Minus Upstream	0.00004	0.000002	0.00003	0.00003
Criterion	0.00002	0.00002	0.00002	0.00002

Table K3-3d**Weighted Surface Water Concentrations for DDT**

Portland Harbor Superfund Site

Portland, OR

	DDT concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
Average Upstream	0.00001	0.00001	0.00002	0.00002
Average Entering Site	0.00001	0.00002	0.00021	0.00014
Average Site	0.00003	0.00003	0.00019	0.00014
Site Minus Upstream	0.00002	0.00002	0.00017	0.00012
Criterion	0.00002	0.00002	0.00002	0.00002

Table K3-3e**Weighted Surface Water Concentrations for PCBs**

Portland Harbor Superfund Site

Portland, OR

	PCB concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
Average Upstream	0.000166	0.000177	0.000074	0.000106
Average Entering Site	0.000277	0.000179	0.000107	0.000155
Average Site	0.000675	0.000457	0.000189	0.000333
Site Minus Upstream	0.000509	0.000280	0.000115	0.000227
Criterion	0.000006	0.000006	0.000006	0.000006

Table K3-3f**Weighted Surface Water Concentrations for 2,3,7,8-TCDD eq**

Portland Harbor Superfund Site

Portland, OR

	2,3,7,8-TCDD EQ concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
Average Upstream	0.0000000293	0.0000000614	0.0000000208	0.0000000263
Average Entering Site	0.0000000486	0.0000000773	0.0000000479	0.0000000505
Average Site	0.0000000863	0.0000001186	0.0000000543	0.0000000676
Site Minus Upstream	0.0000000570	0.0000000572	0.0000000335	0.0000000413
Criterion	0.0000000005	0.0000000005	0.0000000005	0.0000000005

Table K3-4a**Surface Water Concentrations and Net Reduction for cPAHs**

Portland Harbor Superfund Site

Portland, OR

Alternative	Average Site (µg/L)	Average Downtown (µg/L)	Average Upstream (µg/L)	PRG (µg/L)	Net Reduction (%)
A	0.0008	0.0004	0.0001	0.0001	0%
B	0.0001	0.0004	0.0001	0.0001	83%
D	0.0001	0.0004	0.0001	0.0001	93%
E	0.0001	0.0004	0.0001	0.0001	93%
F	0.0000	0.0004	0.0001	0.0001	94%
G	0.00002	0.0004	0.0001	0.0001	97%
I	0.0001	0.0004	0.0001	0.0001	87%

Table K3-4b**Surface Water Concentrations and Net Reduction for DDD**

Portland Harbor Superfund Site

Portland, OR

Alternative	Average Site (µg/L)	Average Downtown (µg/L)	Average Upstream (µg/L)	PRG (µg/L)	Net Reduction (%)
A	0.00005	0.00001	0.00006	0.00003	0%
B	0.00002	0.00001	0.00006	0.00003	68%
D	0.00001	0.00001	0.00006	0.00003	76%
E	0.00001	0.00001	0.00006	0.00003	86%
F	0.000005	0.00001	0.00006	0.00003	91%
G	0.000003	0.00001	0.00006	0.00003	94%
I	0.00001	0.00001	0.00006	0.00003	87%

Table K3-4c**Surface Water Concentrations and Net Reduction for DDE**

Portland Harbor Superfund Site

Portland, OR

Alternative	Average Site (µg/L)	Average Downtown (µg/L)	Average Upstream (µg/L)	PRG (µg/L)	Net Reduction (%)
A	0.00003	0.00002	0.00008	0.00002	0%
B	0.00001	0.00002	0.00008	0.00002	71%
D	0.00001	0.00002	0.00008	0.00002	77%
E	0.00001	0.00002	0.00008	0.00002	81%
F	0.000005	0.00002	0.00008	0.00002	86%
G	0.000004	0.00002	0.00008	0.00002	89%
I	0.00001	0.00002	0.00008	0.00002	81%

Table K3-4d**Surface Water Concentrations and Net Reduction for DDT**

Portland Harbor Superfund Site

Portland, OR

Alternative	Average Site (µg/L)	Average Downtown (µg/L)	Average Upstream (µg/L)	PRG (µg/L)	Net Reduction (%)
A	0.00012	0.00013	0.00002	0.00002	0%
B	0.00001	0.00013	0.00002	0.00002	93%
D	0.00001	0.00013	0.00002	0.00002	94%
E	0.00001	0.00013	0.00002	0.00002	95%
F	0.000004	0.00013	0.00002	0.00002	97%
G	0.000002	0.00013	0.00002	0.00002	98%
I	0.00001	0.00013	0.00002	0.00002	96%

Table K3-4e
Surface Water Concentrations and Net Reduction for
PCBs

Portland Harbor Superfund Site
Portland, OR

Alternative	Average Site (µg/L)	Average Downtown (µg/L)	Average Upstream (µg/L)	PRG (µg/L)	Net Reduction (%)
A	0.000227	0.000050	0.000106	0.000006	0%
B	0.000081	0.000050	0.000106	0.000006	65%
D	0.000061	0.000050	0.000106	0.000006	73%
E	0.000044	0.000050	0.000106	0.000006	81%
F	0.000026	0.000050	0.000106	0.000006	89%
G	0.000019	0.000050	0.000106	0.000006	92%
I	0.000044	0.000050	0.000106	0.000006	81%

Table K3-4f
Surface Water Concentrations and Net Reduction for 2,3,7,8-TCDD eq

Portland Harbor Superfund Site
Portland, OR

Alternative	Average Site (µg/L)	Average Downtown (µg/L)	Average Upstream (µg/L)	PRG (µg/L)	Net Reduction (%)
A	0.0000000413	0.0000000242	0.0000000263	0.0000000005	0%
B	0.0000000032	0.0000000242	0.0000000263	0.0000000005	92%
D	0.0000000025	0.0000000242	0.0000000263	0.0000000005	94%
E	0.0000000022	0.0000000242	0.0000000263	0.0000000005	95%
F	0.0000000013	0.0000000242	0.0000000263	0.0000000005	97%
G	0.0000000016	0.0000000242	0.0000000263	0.0000000005	96%
I	0.0000000025	0.0000000242	0.0000000263	0.0000000005	94%

Table K3-5a**Site Transect Weighted Surface Water Concentrations for cPAHs**

Portland Harbor Superfund Site

Portland, OR

Transect	cPAH concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
RM 11M	0.0004	0.0007	0.0003	0.0004
RM 11W	0.0003	0.0009	0.0007	0.0006
RM 11 E	0.0008	0.0023	0.0006	0.0008
RM 6.3 NS	0.0014	0.0016	0.0005	0.0008
RM 6.3 NB	0.0035	0.0027	0.0006	0.0015
RM 3.9 NS	0.0014	0.0023	0.0005	0.0009
RM 3.9 NB	0.0042	0.0028	0.0009	0.0019
Multnomah NS	0.0001	0.0033	0.0007	0.0008
Multnomah NB	0.0002	0.0032	0.0007	0.0008
RM 2 E	0.0002	0.0019	0.0006	0.0006
RM 2 M	0.0003	0.0026	0.0003	0.0005
RM 2 W	0.0002	0.0018	0.0004	0.0005

Table K3-5b**Site Transect Weighted Surface Water Concentrations for DDD**

Portland Harbor Superfund Site

Portland, OR

	DDD concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
RM 11M	0.00004	0.00002	0.00007	0.00006
RM 11W	0.00006	0.00002	0.00009	0.00008
RM 11 E	0.00005	0.00002	0.00012	0.00010
RM 6.3 NS	0.00018	0.00006	0.00009	0.00011
RM 6.3 NB	0.00025	0.00011	0.00009	0.00013
RM 3.9 NS	0.00027	0.00007	0.00009	0.00014
RM 3.9 NB	0.00000	0.00008	0.00011	0.00008
Multnomah NS	0.00036	0.00008	0.00008	0.00015
Multnomah NB	0.00032	0.00007	0.00010	0.00015
RM 2 E	0.00022	0.00006	0.00005	0.00009
RM 2 M	0.00020	0.00011	0.00005	0.00009
RM 2 W	0.00026	0.00009	0.00006	0.00011

Table K3-5c**Site Transect Weighted Surface Water Concentrations for DDE**

Portland Harbor Superfund Site

Portland, OR

	DDE concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
RM 11M	0.00003	0.00001	0.00011	0.00008
RM 11W	0.00003	0.00004	0.00016	0.00012
RM 11 E	0.00004	0.00004	0.00020	0.00015
RM 6.3 NS	0.00006	0.00004	0.00017	0.00013
RM 6.3 NB	0.00010	0.00006	0.00017	0.00015
RM 3.9 NS	0.00007	0.00004	0.00017	0.00014
RM 3.9 NB	0.00013	0.00004	0.00018	0.00016
Multnomah NS	0.00009	0.00004	0.00014	0.00012
Multnomah NB	0.00009	0.00004	0.00016	0.00013
RM 2 E	0.00005	0.00004	0.00009	0.00008
RM 2 M	0.00005	0.00004	0.00008	0.00007
RM 2 W	0.00005	0.00004	0.00009	0.00007

Table K3-5d**Site Transect Weighted Surface Water Concentrations for DDT**

Portland Harbor Superfund Site

Portland, OR

	DDT concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
RM 11M	0.00001	0.00001	0.00019	0.00013
RM 11W	0.00001	0.00004	0.00022	0.00015
RM 11 E	0.00001	0.00004	0.00029	0.00020
RM 6.3 NS	0.00005	0.00003	0.00025	0.00018
RM 6.3 NB	0.00008	0.00003	0.00022	0.00017
RM 3.9 NS	0.00003	0.00003	0.00027	0.00019
RM 3.9 NB	0.00008	0.00004	0.00029	0.00022
Multnomah NS	0.00005	0.00003	0.00014	0.00011
Multnomah NB	0.00005	0.00003	0.00011	0.00009
RM 2 E	0.00001	0.00002	0.00011	0.00008
RM 2 M	0.00001	0.00003	0.00010	0.00007
RM 2 W	0.00001	0.00001	0.00011	0.00008

Table K3-5e**Site Transect Weighted Surface Water Concentrations for PCBs**

Portland Harbor Superfund Site

Portland, OR

	PCB concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
RM 11M	0.00028	0.00013	0.00008	0.00013
RM 11W	0.00028	0.00023	0.00014	0.00018
RM 11 E	0.00095	0.00056	0.00017	0.00040
RM 6.3 NS	0.00067	0.00024	0.00013	0.00028
RM 6.3 NB	0.00095	0.00029	0.00014	0.00035
RM 3.9 NS	0.00067	0.00046	0.00014	0.00030
RM 3.9 NB	0.00095	0.00044	0.00039	0.00054
Multnomah NS	0.00067	0.00033	0.00025	0.00036
Multnomah NB	0.00066	0.00031	0.00028	0.00037
RM 2 E	0.00043	0.00130	0.00017	0.00033
RM 2 M	0.00038	0.00039	0.00012	0.00021
RM 2 W	0.00043	0.00024	0.00011	0.00020

Table K3-5f**Site Transect Weighted Surface Water Concentrations for 2,3,7,8-TCDD ea**

Portland Harbor Superfund Site

Portland, OR

	2,3,7,8-TCDD EQ concentrations (µg/L)			
	Sept 2006	Nov 2006	High Flow	Weighted Average
RM 11M	0.0000000486	0.0000000536	0.0000000381	0.0000000420
RM 11W	0.0000000487	0.0000001010	0.0000000577	0.0000000590
RM 11 E	0.0000000689	0.0000002884	0.0000000709	0.0000000885
RM 6.3 NS	0.0000000683	0.0000000666	0.0000000426	0.0000000510
RM 6.3 NB	0.0000001616	0.0000001431	0.0000000512	0.0000000865
RM 3.9 NS	0.0000000739	0.0000000894	0.0000000534	0.0000000615
RM 3.9 NB	0.0000002060	0.0000001317	0.0000000735	0.0000001115
Multnomah NS	0.0000000958	0.0000001385	0.0000000704	0.0000000824
Multnomah NB	0.0000000970	0.0000001095	0.0000000709	0.0000000806
RM 2 E	0.0000000302	0.0000000881	0.0000000452	0.0000000450
RM 2 M	0.0000000317	0.0000000676	0.0000000347	0.0000000367
RM 2 W	0.0000000296	0.0000000627	0.0000000298	0.0000000325

Table K4-1a**Initial cPAHs Loading from Upriver, Downtown, and Site Reaches of the lower Willamette River**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	3	3	8	0.7
Load Entering Site	7	44	75	6.7
Load to Columbia River	23	122	78	8.1
Site Load to Columbia River	16	78	2	1.4

Table K4-1b**Initial DDD Loading from Upriver, Downtown, and Site Reaches of the lower Willamette River**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.7	2.1	10.4	0.9
Load Entering Site	1.1	1.0	12.2	1.0
Load to Columbia River	3.9	3.8	12.4	1.2
Site Load to Columbia River	2.8	2.8	0.2	0.1

Table K4-1c**Initial DDE Loading from Upriver, Downtown, and Site Reaches of the lower Willamette River**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.5	2.1	16.4	1.3
Load Entering Site	0.7	1.6	20.0	1.6
Load to Columbia River	1.4	2.2	21.5	1.8
Site Load to Columbia River	0.7	0.7	1.5	0.1

Table K4-1d**Initial DDT Loading from Upriver, Downtown, and Site Reaches of the lower Willamette River**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.2	0.6	2.9	0.2
Load Entering Site	0.2	1.3	30.9	2.5
Load to Columbia River	0.7	1.6	28.5	2.3
Site Load to Columbia River	0.5	0.3	-2.4	-0.2

Table K4-1e**Initial PCB Loading from Upriver, Downtown, and Site Reaches of the lower Willamette River**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	4	10	11	1.1
Load Entering Site	6	10	16	1.6
Load to Columbia River	14	26	28	2.9
Site Load to Columbia River	9	16	12	1.4

Table K4-1f**Initial 2,3,7,8-TCDD eq Loading from Upriver, Downtown, and Site Reaches of the lower Willamette River**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.0006	0.0035	0.0031	0.00030
Load Entering Site	0.0010	0.0043	0.0071	0.00065
Load to Columbia River	0.0018	0.0067	0.0081	0.00077
Site Load to Columbia River	0.0008	0.0023	0.0009	0.00012

Table K4-2a
cPAHs Load Reduction for Alternative B
 Portland Harbor Superfund Site
 Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	3	3	8	0.7
Load Entering Site	7	44	75	6.7
Load to Columbia River	3	20	13	1.3
Site Load to Columbia River	-4	-24	-63	-5

Table K4-2b
DDD Load Reduction for Alternative B
 Portland Harbor Superfund Site
 Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.7	2.1	10.4	0.9
Load Entering Site	1.1	1.0	12.2	1.0
Load to Columbia River	1.0	0.5	0.7	0.1
Site Load to Columbia River	-0.1	-0.5	-11.6	-0.9

Table K4-2c
DDE Load Reduction for Alternative B
 Portland Harbor Superfund Site
 Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.5	2.1	16.4	1.3
Load Entering Site	0.7	1.6	20.0	1.6
Load to Columbia River	0.3	0.0	1.5	0.1
Site Load to Columbia River	-0.4	-1.5	-18.5	-1.5

Table K4-2d**DDT Load Reduction for Alternative B**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.2	0.6	2.9	0.2
Load Entering Site	0.2	1.3	30.9	2.5
Load to Columbia River	0.0	0.1	1.9	0.2
Site Load to Columbia River	-0.2	-1.2	-29.0	-2.3

Table K4-2e**PCB Load Reduction for Alternative B**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	4	10	11	1.1
Load Entering Site	6	10	16	1.6
Load to Columbia River	4	6	6	0.7
Site Load to Columbia River	-2	-4	-10	-0.9

Table K4-2f**2,3,7,8-TCDD eq Load Reduction for Alternative B**

Portland Harbor Superfund Site

Portland, OR

River Reach	Low Flow (g/day)	Stormwater-Influenced Flow (g/day)	High Flow (g/day)	Annual Average Load (kg/yr)
Upriver Load	0.0006	0.0035	0.0031	0.00030
Load Entering Site	0.0010	0.0043	0.0071	0.00065
Load to Columbia River	0.0001	0.0003	0.0018	0.00015
Site Load to Columbia River	-0.0009	-0.0041	-0.0054	-0.00050

Figures

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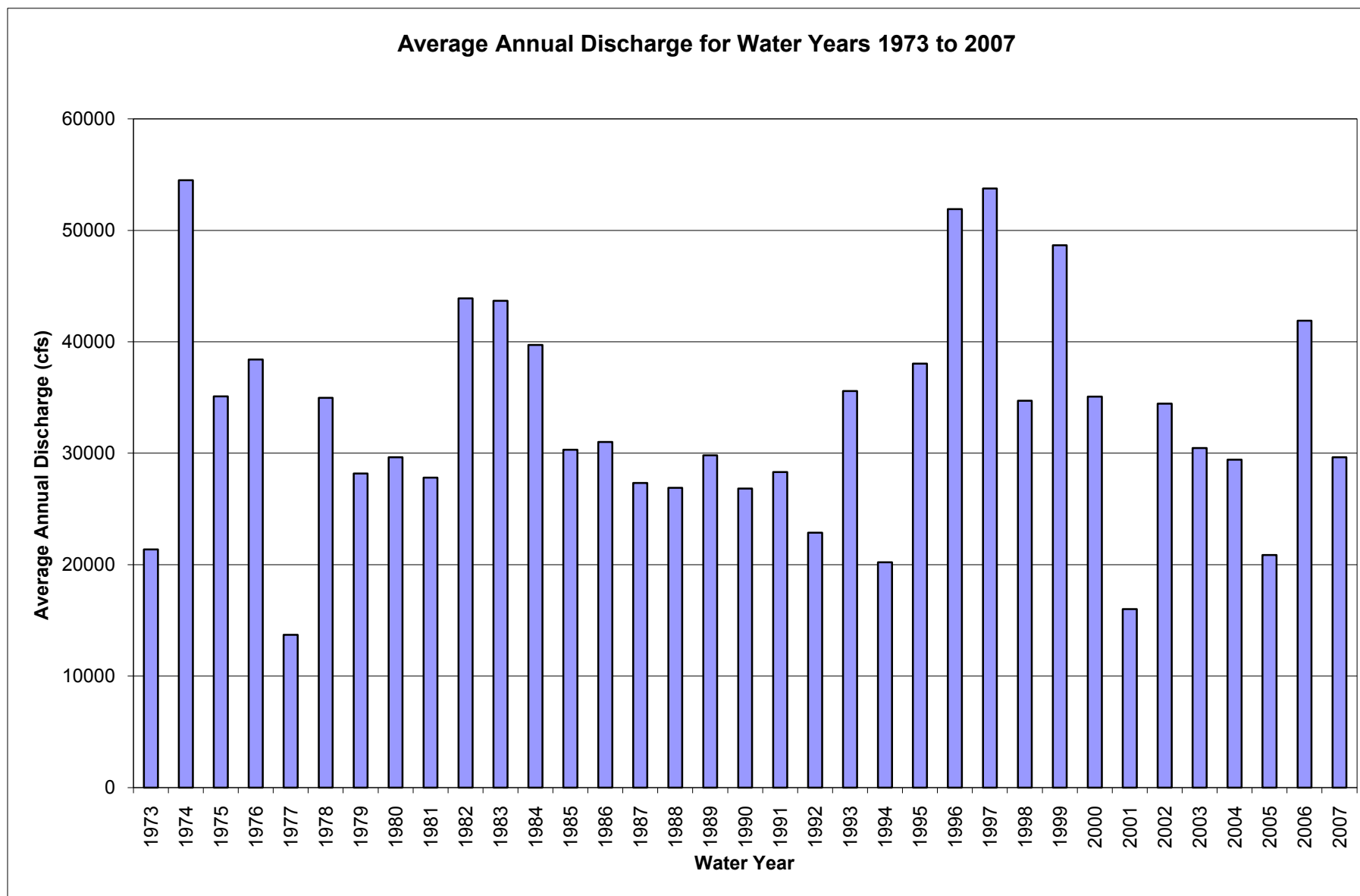


Figure K3-1
Average Annual Discharge for Water Years 1973 to 2007